

What is claimed is:

1. A method for making micro-protrusions or micro-cavities on a surface of a substrate comprising the steps
5 of:

placing said substrate in a process chamber;
supporting a mask member independent of and in front of
said substrate, said mask member having a micro shielding
surface; and

10 irradiating fast atomic beams onto said surface of said
substrate through said mask member.

2. A method according to claim 1, wherein said
substrate is a slider member.

15 3. A method according to claim 1, wherein fast atomic
beams are irradiated substantially at right angle onto said
surface of said substrate.

20 4. A method according to claim 1, wherein said mask
member comprises micro-objects dispersed on said surface of said
substrate.

25 5. A method according to claim 4, wherein said
micro-objects dispersed on said substrate surface comprise

micro-powders.

6. A method according to claim 5, wherein said micro-objects comprise at least one material selected from the 5 group comprising alumina, carbon, Si_3N_4 , SiC, TiN, ZrO_2 , MgO , and synthetic resin.

7. A method according to claim 1, wherein said mask member comprises a plurality of fine wire or rod members disposed 10 in contact with or in proximity of said substrate surface.

8. A method according to claim 7, wherein said plurality of wire or rod members are arranged in parallel.

15 9. A method according to claim 7, wherein said plurality of wire or rod members are arranged to form a matrix.

10. A method according to claim 1, wherein said mask member comprises a plate member, having a specific pattern of 20 cavities, disposed in contact with or in proximity of said substrate surface.

11. A method for making micro-protrusions or micro-cavities on a surface of a substrate comprising the steps 25 of:

dispersing micro-particles on said substrate surface; and
irradiating said substrate surface with fast atomic beams
at an angle of incidence determinable by a slant angle measured
with respect to a rotation axis normal to said substrate surface
5 while a beam source relatively swivels about said rotation axis.

12. A method according to claim 11, wherein said
substrate is a slider member.

10 13. A method for making micro-protrusions or
micro-cavities on a surface of a substrate comprising the steps
of:

dispersing micro-particles susceptible to etching by fast
atomic beams on said substrate surface; and

15 irradiating said substrate surface with fast atomic beams
at an angle of incidence determinable by a slant angle measured
with respect to a rotation axis normal to said substrate surface
while a beam source relatively swivels about said rotation axis.

20 14. A method according to claim 13, wherein said
substrate is a slider member.

15. A method for making micro-protrusions or
micro-cavities on a surface of a substrate comprising the steps
25 of:

a first irradiation step irradiating said substrate surface with fast atomic beams through a mask member consisting of parallel wire or rod members disposed in contact with or in proximity to said substrate surface; and

5 a second irradiation step irradiating said substrate
surface with fast atomic beams through a mask member consisting
of parallel wire or rod members disposed in contact with or in
proximity to said substrate surface, said parallel wire or rod
members are oriented at right angles or at an oblique angle to
10 those in said first irradiation step.

16. A method according to claim 15, wherein said substrate is a slider member.

15 17. A slider member formed with a plurality of
micro-protrusions or micro-cavities on at least one surface
thereof, wherein said micro-protrusions or micro-cavities
comprise top or bottom surfaces and side surfaces, and an
inclusive angle of side surfaces of said micro-protrusions or
20 micro-cavities is selected within a range of angles between 80
to 110 degrees measured with respect to the relative sliding
direction of said slider member.

18. A slider member formed with a plurality of
25 micro-protrusions or micro-cavities on at least one surface

thereof, wherein said substrate is produced through the process comprising the steps of:

5 placing said substrate in a process chamber;
 supporting a mask member independent of and in front of
 said substrate, said mask member having a micro shielding
 surface; and
 irradiating fast atomic beams onto said surface of said
 substrate through said mask member.